الجامعة الافتراضية السورية
SYRIAN VIRTUAL UNIVERSITY

Automata & Formal Languages

Course Definition

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Syrian Arab Republic		الجمهورية العربية السورية
Ministry of Higher Education		وزارة التعليم العالـــي
Syrian Virtual University		الجامعة الافتراضية السورية

1. Basic Information:

Course Name	Automata & Formal Languages
Course Code	BAU501
Number of Presentational Sessions*	8*2
Number of Synchronous Sessions**	8
Number of Shorter Tests***	2
Number of Exams***	1
Theoretical Sessions Work Load (hrs.)	48
Practical Sessions Work Load (hrs.)	24
Credit Hours	5

***Each presentational session comprises both recorded lecture (1.5 hrs.) and interactive learning content (1.5 hrs.).**

****Each synchronous session comprises the interactive lecture carried out in real time in a virtual class (1.5 hrs.).**

*****Each shorter test is 0.5 hr. long. The final exam is 2 hrs. long.**

N.B.

Generally, each chapter requires two presentational sessions: one for the recorded content and one for the interactive content (unless the chapter is too long, in which case it may require more sessions) This note applies to synchronous sessions as well, where each chapter requires one synchronous session generally.

2. Prerequisites courses:

Course	Code
Discrete Mathematics	BDM501
Data Structures & Algorithms I	BDA501

3. Course Objectives:

The aim of this course "Automata & Formal Languages", to play an important role in projecting and realizing compilers.

The course reviews the basics of grammars and formal languages. The different grammars and languages are discussed based on Chomsky hierarchy. Then, we deal in detail with the finite automata and the languages accepted by them, while the pushdown automata and the corresponding accepted languages are discussed.

4. Learning Outcomes (LO):

By the end of this course, the learner is expected to acquire and learn the following subjects:

- Introduction: Alphabets, Languages, Automata
- DFA and NFA Basics
- RE-to-DFA Algorithm
- DFA-to-RE Algorithm
- Pumping Lemma
- Characteristics of Regular Languages
- Introduction CFG
- Derivation & Ambiguity
- Chomsky Normal Form
- CYK
- Push-Down Automata

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5. Assessment Results:

Chapter Number	Chapter Title	General Objectives	Assessment Type				
			Interactive Content & Recorded Sessions	Applied Activities (Synch. Sessions)	Final Exam*/ Shorter Tests**	Presentations and Interviews***	Reports ***
CH1	Introduction: Alphabets, Languages, Automata	Comprehension– Analytical Thinking –Tools and Application Hands– On	√	√	√	√	√
CH2	DFA Definition	Comprehension– Analytical Thinking –Tools and Application Hands– On	√	√	√	√	√
CH3	NFA Definition	Comprehension– Analytical Thinking –Tools and Application Hands– On	√	√	√	√	√
CH4	Equivalent between FA and RL	Comprehension– Analytical Thinking –Tools and Application Hands– On	√	√	√	√	√

CH5	Characteristics of Regular Languages	Comprehension– Analytical Thinking –Tools and Application Hands– On	√	√	√	√	√
CH6	Introduction: CFG	Comprehension– Analytical Thinking –Tools and Application Hands– On	√	√	√	√	√
CH7	Chomsky Normal Form	Comprehension– Analytical Thinking –Tools and Application Hands– On	√	√	√	√	√
CH8	Push–Down Automata	Comprehension– Analytical Thinking –Tools and Application Hands– On	√	√	√	√	√

***The final exam is two hours long and is given at the end of the course.**

****Shorter tests are about 30 minutes long and are given after three or four lectures throughout the semester during synchronous sessions.**

*****Presentations, interviews, and reports are submitted once after each three or four lectures throughout the semester during synchronous sessions.**

6. Course Syllabus:

Chapter	Subject	Content	Number of Learning Objects	Number of synchronous Learning Objects
CH1	Introduction: Alphabets, Languages, Automata	1. Introduction: Language, Alphabet 2. Variables and Data types 3. Operations on languages 4. Regular Languages 5. Examples on Regular languages	5	2
CH2	DFA Definition	1. Finite Automata 2. Deterministic Finite Automata 3. Accepted inputs to languages 4. Examples on Deterministic Finite Automata	4	2
CH3	NFA Definition	1. Non-deterministic Finite Automata 2. Accepted Inputs to Languages 3. DFA-to-NFA Algorithm 4. Examples on Non-deterministic Finite Automata 5. Examples on DFA-to-NFA Algorithm	5	2
CH4	Equivalent between FA and RL	1. RL==NFA==DFA 2. RL-to-NFA Algorithm 3. DFA-to-RL Algorithm	5	2

		4. Minimal DFA 5. Examples on Minimal DFA		
CH5	Characteristics of Regular Languages	1. Properties of Regular Languages 2. Regular Languages Decision Making Algorithms 3. Pumping lemma	**3**	**1**
CH6	Introduction: CFG	1. Context Free Grammars 2. Grammar Model of Definite Language Generation 3. Acknowledge of Grammar Model Generated Language 4. Derivation 5. Ambiguity 6. Properties of Context Free Languages 7. Decision Making Algorithms of Context Free Languages	**7**	**3**
CH7	Chomsky Normal Form	1. Eliminate ε–rules 2. Eliminate unit rules 3. Eliminate rules with nonsolitary terminals 4. Binary Rules	**4**	**2**
CH8	Push–Down Automata	1. PDA 2. CFG–to–PDA	**2**	**1**

7. Practical Activity:

- **Tools and Labs:**

Tool Name	Description

- **Practical Activities per Chapters:**

Chapter	Activities Type	Remarks
CH1	☑ Exercises ☑ Homework ☐ Webinars ☐ Projects ☑ Experiments ☐ Others	Homework
CH2	☑ Exercises ☑ Homework ☐ Webinars ☐ Projects ☑ Experiments ☐ Others	Homework

CH3	☑ Exercises ☑ Homework ☑ Webinars ☐ Projects ☑ Experiments ☐ Others	Homework
CH4	☑ Exercises ☑ Homework ☐ Webinars ☐ Projects ☑ Experiments ☐ Others	Homework
CH5	☑ Exercises ☑ Homework ☐ Webinars ☐ Projects ☑ Experiments ☐ Others	Homework
CH6	☑ Exercises ☑ Homework ☐ Webinars ☐ Projects ☑ Experiments ☐ Others	Homework

CH7	☑ Exercises ☑ Homework ☐ Webinars ☐ Projects ☑ Experiments ☐ Others	Homework
CH8	☑ Exercises ☑ Homework ☐ Webinars ☑ Projects ☑ Experiments ☐ Others	

8. References:

1. Theory of Automata, Formal Languages and Computation.
2. Introduction to Automata Theory, Languages, and Computation.